COMMUNICATING THE UNCERTAINTY OF PROJECTIONS

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2014 Trustees Report

Social Security actuarial projections

- Actuarial status under the intermediate assumptions
- Expectations of lawmakers
- Measures to address uncertainty
- Ways to communicate uncertainty to lawmakers
- Future direction

Actuarial status under the intermediate assumptions

- Social Security (OASDI) actuarial status:

  2014 Annual Report of the Board of Trustees

  - Actuarial deficit is 2.88 percent of taxable payroll.
  - Combined OASDI Trust Fund reserves deplete in 2033.
  - Annual cost, *expressed as percent of GDP*, rises from 4.9 percent in 2014 to 6.2 percent in 2035, then roughly stabilizes at about 6.0 percent for the period 2045-2088.

Expectations of lawmakers

- Congress and the Administration have large workloads; they consider many changes to many programs and deal with all sorts of political issues.
- Their desire is to have quickly and easily understood information.

Uncertainty

- We and the Trustees want to address uncertainty when presenting our estimates.
- We base the projections on historical data and assumptions; the future is likely to be different.

Measures to address uncertainty

In addition to projections using the intermediate assumptions, we include:

1. Low-cost and high-cost estimates
2. Sensitivity analysis
3. Stochastic modeling

Measures to address uncertainty

1. **Low-cost and high-cost estimates:**

   Varies all principal assumptions simultaneously in order to portray a generally more optimistic or pessimistic future financial status of the OASDI program.

Measures to address uncertainty

2. Sensitivity analysis:

Intermediate projections are used as reference point, and one assumption at a time is varied. Assumptions varied include those pertaining to fertility, mortality, immigration, real wage, CPI, real interest.

Measures to address uncertainty

3. Stochastic modeling:

- 5,000 independent stochastic simulations
- Allow demographic and economic variables to vary over long-range
- Use historical variances around a mean equal to intermediate assumption for each variable
- Probability distributions obtained from simulations give confidence intervals for measures such as annual cost rates, reflecting annual variation

Ways to communicate uncertainty to lawmakers

- All three uncertainty estimates are in the Trustees Report. (The overview of the 2014 Trustees Report contains a brief discussion of all three uncertainty measures.)
- Sensitivity estimates are included in Agency Financial Report.
- Only the intermediate scenario is used in presenting the financial effects of proposals/options that change the Social Security program.

Ways to communicate uncertainty to lawmakers

In the body of the Trustees Report, the low-cost and high-cost estimates are presented with the intermediate scenario. Almost all of the tables include estimates for all three scenarios.

Ways to communicate uncertainty to lawmakers

In the appendix of the Trustees Report, sensitivity estimates are presented. For example, here we show sensitivity of some of the intermediate results to the ultimate fertility rate assumption:

Sensitivity to Varying Fertility Assumptions			
[As a percentage of taxable payroll]			
	Ultimate total fertility rate:		
	1.7	*2.0*	*2.3*
Actuarial balance: 2014-88	-3.27	-2.88	-2.51
Annual balance for 2088	-7.18	-4.90	-3.06
Year of combined trust fund reserve depletion	2033	2033	2033

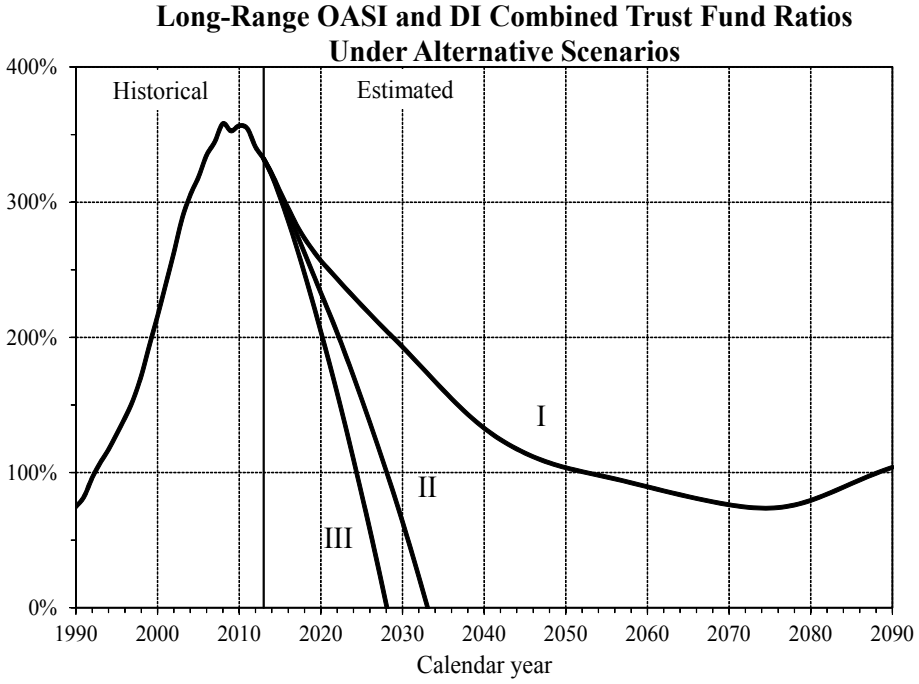
Ways to communicate uncertainty to lawmakers

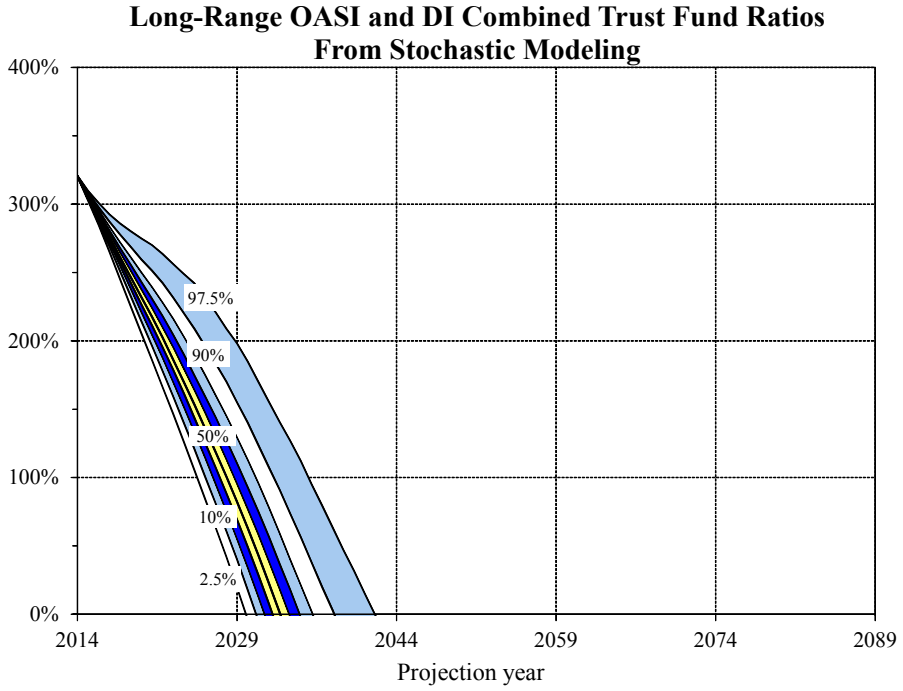
In the appendix of the Trustees Report, stochastic modeling estimates are presented. For example, here is an excerpt from this section of the appendix, which presents the likelihood of the long-range actuarial balance.

Median: 50th percentile	80-percent confidence interval		95-percent confidence interval	
	10th percentile	90th percentile	2.5th percentile	97.5th percentile
-2.99	-4.25	-1.88	-4.98	-1.28

Ways to communicate uncertainty to lawmakers

The overview of the 2014 Trustees Report includes graphs of trust fund ratios under the alternative scenarios and under the stochastic model.

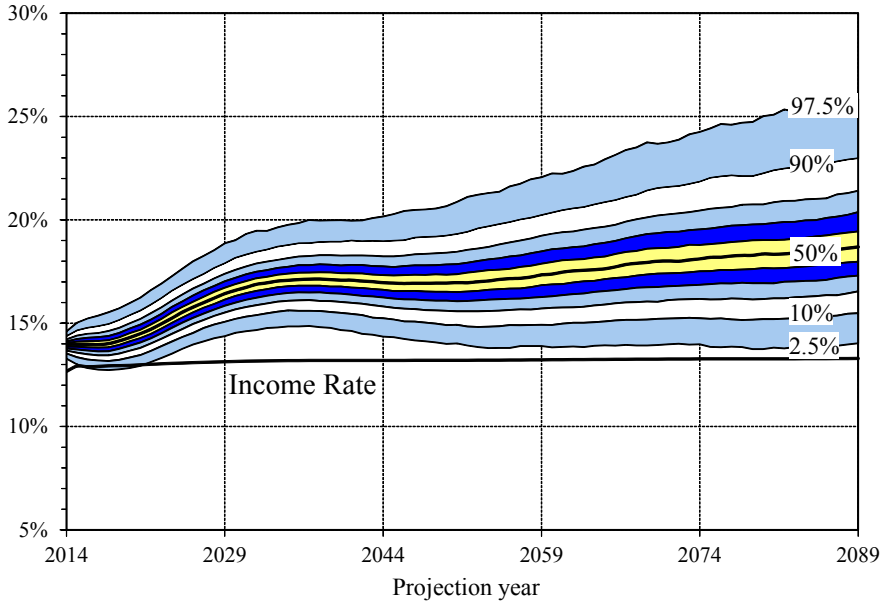




Ways to communicate uncertainty to lawmakers

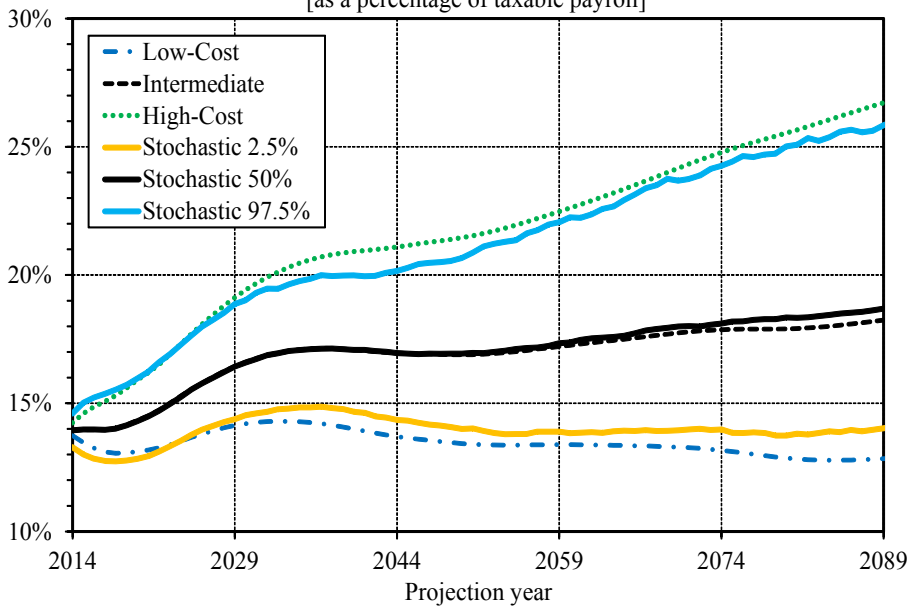
If instead, the overview included graphs of cost rates under the alternative scenarios and under the stochastic model, then many readers would take away a different message.

Long-Range OASDI Cost Rates From Stochastic Modeling



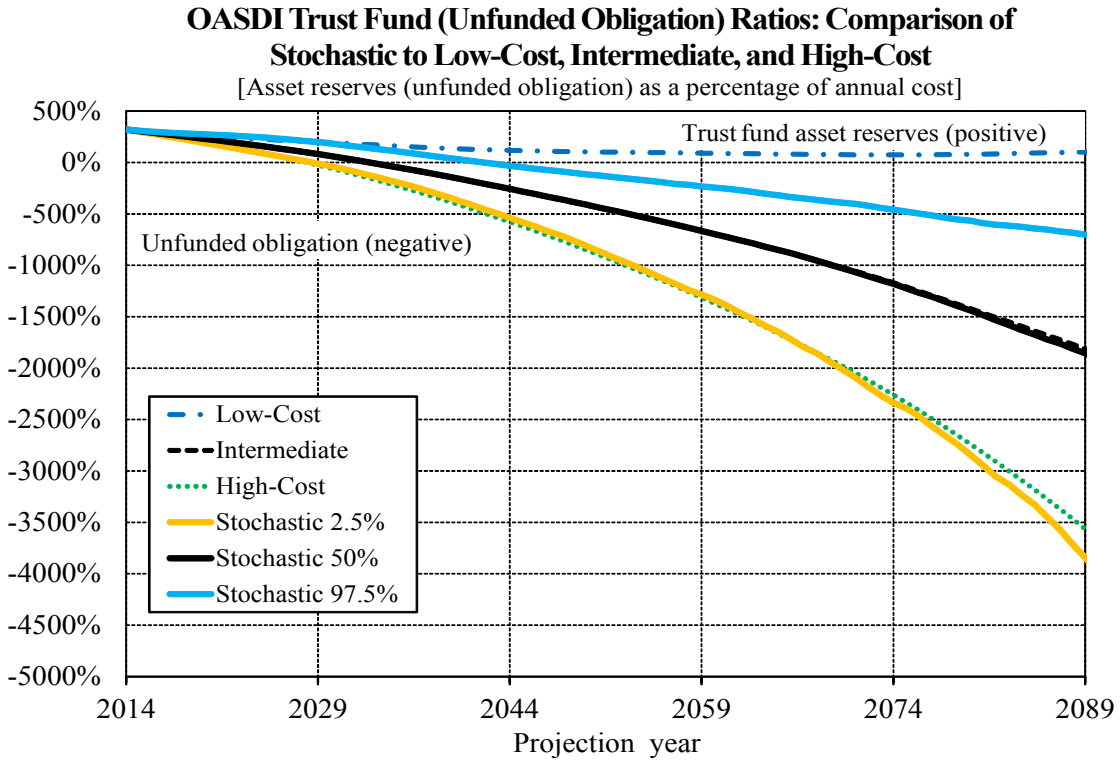
OASDI Cost Rates: Comparison of Stochastic to Low-Cost, Intermediate, and High-Cost Alternatives

[as a percentage of taxable payroll]



Ways to communicate uncertainty to lawmakers

The stochastic appendix of the 2014 Trustees Report includes a graph which expands on the concept of trust fund ratios in order to provide a more complete picture.



Future direction

- Include stylized scenarios?
- Choose the range for values of key assumptions, such that they are consistent, in a probabilistic sense, both across and within assumptions.
- Improve our stochastic model – currently working on adding some form of parameter uncertainty to the model.
- Add more variables; possibly model interaction between more variables.

Future direction: adding parameter uncertainty to stochastic model

- Example – total fertility rate (using data from 1917 – 2011)
- From software package (EViews):

$$F_t = 0.05 + 1.97F_{t-1} - 1.48F_{t-2} + 0.89F_{t-3} - 0.41F_{t-4} + e_t - 0.62e_{t-1}$$

- Deviations form (deviation from the historical-period mean):

$$F_t = 2.37 + 1.97f_{t-1} - 1.48f_{t-2} + 0.89f_{t-3} - 0.41f_{t-4} + e_t - 0.62e_{t-1}$$

- Current formula (deviation from the intermediate mean assumption):

$$F_t = F_{TR,t} + 1.97f_{t-1} - 1.48f_{t-2} + 0.89f_{t-3} - 0.41f_{t-4} + e_t - 0.62e_{t-1}$$

Where:

F_t = Total fertility rate in year t

f_t = Total fertility rate in year t, in deviations form

e_t = Error term for year t

$F_{TR,t}$ = Total fertility rate in year t, under the intermediate assumptions